**City of Santa Barbara**
Parks and Recreation Department

**Memorandum**

**DATE:** January 19, 2011

**TO:** Creeks Restoration/Water Quality Improvement Program
Citizen Advisory Committee

**FROM:** Jill Murray, Water Quality Research Coordinator

**SUBJECT:** WATER QUALITY MONITORING AND RESEARCH PROGRAM FISCAL YEAR 2010 REPORT

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COMMITTEE DIRECTION – FOR DISCUSSION

That the Committee receive a presentation and discuss the results from the Water Quality Monitoring and Research Program Fiscal Year 2010 Report.

DISCUSSION

Background

The Water Quality Monitoring Program provides data for the Creeks Division to establish baselines of water quality, track long term changes, and assess project performance. This information is needed to understand sources and routes of pollution to creeks, to prioritize future projects for the Division, and to provide a basis for understanding the effectiveness of the current program. The Creeks Division strives to maintain a dynamic, adaptive monitoring program that is driven by specific research questions.

The goals of the monitoring program are to:

1. Quantify the levels (concentration and flux, or load) of microbial contamination and chemical pollution in watersheds throughout the City.
2. Evaluate impacts of pollution on beneficial uses of creeks and beaches, including recreation and habitat for aquatic organisms.
3. Evaluate the effectiveness of the City's restoration and water quality treatment projects, which includes collecting baseline data for future projects.
4. Identify sources of contaminants and pollution in creeks and storm drains.
5. Evaluate long-term trends in water quality.

The underlying motivation behind the monitoring program is to obtain information that the City can use to:

1. Develop strategies for water quality improvement, including prioritization of capital projects and outreach/education programs.
2. Communicate effectively with the public about water quality.

The Annual Report describes sampling and results that were based on the Fiscal Year 2010 Research and Monitoring Plan, which is organized by research questions that have been reviewed by the Creeks Advisory Committee. This year, a substantial amount of data analysis has been postponed until Fiscal Year 2011, due to Creeks Division staff focusing on the Source Tracking Protocol Development Project, the Beach Water Quality statistical analysis, and the Slurry Seal Project.

The monitoring program consists of eight key elements:

1. Watershed Assessment
2. Storm Monitoring
3. Restoration and Water Quality Project Assessment
4. Beach Water Quality
5. Source Tracking/Illicit Discharge Detection
6. Creeks Walks/Clean ups
7. Bioassessment
8. Methods Development

In June 2010, the Committee received a mid-year update on water quality monitoring and concurred with the recommendation to implement the proposed Fiscal Year 2011 Research Plan. Topics that were discussed included sediment quality, storm monitoring, street slurry sealing, and beach water quality, along with recommended changes for the 2011 Fiscal Year Research Plan. At the present time, the Committee will receive a summary of the Fiscal Year 2010 Annual Water Quality Report, with a focus on beach warnings at Arroyo Burro Beach, long term trends in water quality, and canine scent tracking research. In addition, staff will discuss updates to the Creeks sampling table, updates to the State Water Board's method of toxicity assessment, and new literature reports about indicator bacteria growth in the environment. Please see the attached map to identify sampling locations. The report is available online at www.sbcreeks.com.

<u>Fiscal Year 2010 Annual Water Quality Monitoring Report</u>

Highlights from water quality sampling and data analysis in FY 2010 include:

- Sediment testing in Arroyo Burro Estuary, Mission Lagoon, Sycamore Lagoon, and Laguna Channel over three years has shown that the sediments are generally nontoxic to bottom-dwelling organisms. However, pyrethroid pesticides are an emerging constituent of concern and have been found in estuarine sediments.

- Storm monitoring also found high levels of pyrethroids in creek water samples, including high levels of Esfenvalerate and L-Cyhalothrin in Mission Creek and high levels of Cyfluthrin in Sycamore Creek.
- Toxicity testing of storm drain samples collected during a late-season storm showed no toxicity to fathead minnows.
- In very limited sampling that was conducted to investigate water quality effects from the Jesusita Fire, no increases in metals, PAHs, or toxicity were observed.
- A pilot test showed increased toxicity and foam associated with slurry sealing of road surfaces. Additional field work was conducted in summer and fall 2010; data analysis is still underway.
- Results from monitoring the Summer Urban Runoff Facility, the UV disinfection project at the Westside Drain, shows that the project continues to reduce fecal indicator bacteria to near zero levels in the effluent. However, indicator bacteria numbers rise to background levels very quickly downstream. The increase is likely due to indicator bacteria growth in Old Mission Creek rather than from new sources of input.
- Additional data analysis supports conclusions in the Fiscal Year 2009 report that there have been long-term improvements in indicator bacteria levels at Santa Barbara beaches (see below).
- High frequencies of beach warnings for indicator bacteria were seen at all beaches in Fiscal Year 2010 due to the large number of rain storms during the wet season.
- Arroyo Burro Beach exhibited a high number of beach warnings in dry weather as well, which was likely to due to indicator bacteria growth in the estuary and the open status of the estuary mouth throughout the summer (see below).
- Statistical analyses of indicator bacteria from Santa Barbara beaches showed a strong relationship between bacteria levels and rainfall, lagoon status (open or closed), and a modest influence of tide level and direction.
- Extensive field work was conducted in support of the State-funded Source Tracking Protocol Development Project, including dye testing, smoke testing, and automatic storm drain sampling.
- A Water Environment Research Foundation-funded project supported the use of canine scent tracking (sewage sniffing dogs) to investigate pollution sources (see below).

<u>Beach Warnings at Arroyo Burro</u>

Samples for fecal indicator bacteria (FIB) at local beaches are collected by the County of Santa Barbara, the City of Santa Barbara, and the Santa Barbara Channel Keeper. When levels exceed criteria set forth in Assembly Bill 411 (AB411), warnings are posted at the respective beaches. During the AB411 season (April 1 to October 31), Arroyo Burro Beach was posted frequently for indicator bacteria exceedances, causing curiosity and concern among Santa Barbara beachgoers. The Creeks Division has analyzed data from past years and 2010 to investigate potential causes of the high exceedances rate.

There were 18 warnings posted at Arroyo Burro Beach during the AB411 season, six of which were due to wet weather runoff. The number of warnings was higher than in any AB411 season since testing began in 1997, but not high enough to be considered an outlier, as 16 warnings were posted in both 1998 and 2000. In 2008 there were 12 warnings, and in 2009 only five warnings. Among the warnings in 2010, there was no consistent pattern of which indicator bacteria groups (total coliform, E. coli/fecal coliform, enterococcus, or total coliform-to-fecal coliform ratio) exceeded the criteria.

Based on statistical analysis presented to the Committee in June 2010, Arroyo Burro is far likelier to have exceedances when the estuary mouth is open to the ocean. When the estuary is, exeedances are 50% more likely for enterococcus, 300% more likely for fecal coliform, and 1000% more likely for total coliform compared to rates when the estuary is closed. In 2008 and 2010, both years with high exceedance rates, the estuary was open all summer, whereas it was closed on approximately half of the sample dates in the 2009 AB411 season. Therefore, it appears that the high number of warnings in 2010 is likely due to the winter rain patterns and wave conditions leading to the pattern of an open estuary.

Given the importance of the lagoon status, creek indicator bacteria levels were also investigated. Arroyo Burro generally has lower indicator bacteria levels than Mission and Sycamore Creeks. At times total coliform levels are higher in Arroyo Burro, but not in most of 2010, and there was nothing unusual about Arroyo Burro creek indicator bacteria levels throughout the year. Based on Creeks Division sampling data, it appears that indicator bacteria grow in the estuary, due to the warm temperatures and high nutrient levels. However, such growth is not indicative of a health risk.

In addition to the supply of indicator bacteria from the creek and estuary, there is also growth of indicator bacteria on rotting kelp and sand grains. This indicator bacteria growth may stem from inoculation from bird or dog waste, or it may arise from the creek itself. It is important to note that the growth of indicator bacteria on kelp or sand does not represent a risk to swimmers – human pathogens generally require a host to replicate.

Long-Term Trends in Water Quality

In the Fiscal Year 2009 Annual Water Quality Report, evidence was presented to suggest that water quality has improved over the past ten years at beaches within the City. The analysis was based on Heal the Bay Beach Report Card Annual Grades, which are in turn based on complicated algorithms using data from the three indicator bacteria groups (total coliform, *E. coli*/fecal coliform, and enterococcus). Because the algorithms have been altered over time, it was not clear if indicator bacteria levels had also improved. The Creeks Division planned to examine raw FIB data provided by the County of Santa Barbara and look at long-term trends. Stephanie Dolmat-Connel, a water quality intern hired by the Creeks Division, conducted an extensive analysis of beach indicator bacteria data.

According to the analysis, which included data through 2009, levels have improved across all three FIB groups for E. Beach at Mission Creek. This result may be due to a change in beach management, i.e. there is a more often a sand berm across the estuary mouth. For other FIB groups and beaches, results are more variable. Exeedance rates have decreased for most beaches and most FIB groups. However, the spike in rainfall over the 2009-2010 winter may influence long-term trends.

Source Tracking and Illicit Discharge Detection

The Creeks Division is working with Dr. Patricia Holden (UCSB) to complete the Source Tracking Protocol Development Project, which is funded by the State Water Board's Proposition 50 Clean Beaches Initiative Grant Program. Ongoing work includes use of dye and smoke testing techniques in storm drains, along with molecular techniques for identifying areas contaminated with human waste.

In addition, the Creeks Division worked with UCSB and Environmental Canine Services to test canine scent tracking (sewage sniffing dogs) as a potential tool, with field work conducted in June 2010 and laboratory and statistical work completed in September 2010. The study was completed with funding from the Water Environment Research Foundation (WERF). The results of the study were very promising and the City submitted a Final Report to WERF in December 2010. The abstract of the report is presented here:

> Advances in microbial source tracking have enabled communities to gain more information about the specific hosts that may be responsible for elevated indicator bacteria levels in recreational waters. However, even when human-specific contamination can be traced to general areas, finding exact origins remains challenging due to sample costs and processing times. This study sought to test the use of a new qualitative tool for source tracking, canine scent tracking (sewage-sniffing dogs), to provide real-time results and low sample cost for illicit discharge detection.
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> Canine responses were compared against traditional wastewater indicators, illicit discharge detection tracers, and emerging human-specific waste markers in storm drain locations in Santa Barbara, CA. Canine scent tracking was also tested for effectiveness in locating contaminated inputs to storm drains, addressing a specific hypothesis of contamination arising from illicit dumping from recreational vehicles, and conducting systematic outfall and storm drain reconnaissance. Based on the statistical and qualitative results presented in this pilot-scale study, canine scent tracking is a tool that should be expanded for use by researchers and stormwater managers.

A highlight of the work was uncovering a direct leak from the sanitary sewer to the Hope St. storm drain. Fortunately, this drain has been diverted to the sanitary sewer during dry weather for several years.

Next Steps

Staff will continue implementing the Fiscal Year 2011 Research Plan and carry out scheduled weekly, quarterly, project, and storm sampling. Staff will also conduct research with UCSB on the Source Tracking Protocol grant.

cc: Cameron Benson, Creeks Restoration/Clean Water Manager
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